

CALIFORNIA ENERGY COMMISSION

16 NINTH STREET
SACRAMENTO, CA 95814-5512



DATE: August 21, 2003

TO: Interested Parties

FROM: Connie Bruins, Compliance Project Manager

SUBJECT: **Midway Sunset Cogeneration Project (85-AFC-3C)
Public Review of Staff Analysis of Proposed Project Modifications
(Add Selective Catalyst Reduction Systems to Reduce NOx
Emissions)**

On June 11, 2003, the California Energy Commission (Energy Commission) received a petition from the Midway Sunset Cogeneration Company (MSCC) to amend the Energy Commission Decision for the Midway Sunset Cogeneration Project (85-AFC-3C).

The Midway Sunset Project is a 225 megawatt, cogeneration, natural gas-fired power plant that began operation in May 1989. The facility is located in Fellows in Kern County, California, within the boundaries of the San Joaquin Valley Air Pollution Control District (District), and uses cogeneration steam to aid in the enhanced oil recovery process.

The proposed modifications to add Selective Catalyst Reduction Systems, will allow MSCC to reduce NOx emissions to meet the District's Rule 4703, Stationary Gas Turbines (amended April 25, 2002) Standard, Tier 2, NOx compliance limit of 5 ppmvd at 15 percent O₂.

Energy Commission staff reviewed the proposed petition and assessed the impacts of this proposal on environmental quality, public health and safety. Staff proposes revisions to existing Conditions of Certification for Air Quality (AQ)-18 and AQ-48 through AQ-54. It is the Energy Commission staff's opinion that, with the implementation of revised conditions, the project will remain in compliance with applicable laws, ordinances, regulations, and standards and that the proposed modifications will not result in a significant adverse direct or cumulative impact to the environment (Title 20, California Code of Regulations, Section 1769).

The air quality staff analysis is attached for your information and review. Energy Commission staff intends to recommend approval of the petition at the September 9, 2003, Business Meeting of the Energy Commission. If you have comments on this proposed project change, please submit them to me at the address above prior to September 9, 2003. If you have any questions, please call me at (916) 654-4545 or e-mail at cbruins@energy.state.ca.us.

Attachment

Midway-Sunset Cogeneration Power Project (85-AFC-3)
Request to Amend the Air Quality Conditions of Certification
Prepared by: Joseph M. Loyer

Amendment Request

The Midway-Sunset Cogeneration Company (MSCC) has submitted a petition to amend the Energy Commission's Decision (Condition of Certification AQ-18 and add Conditions of Certification AQ-48 through -54) for the Midway-Sunset Cogeneration Power Plant (MSPP) to reflect the addition of ammonia injected Selective Catalytic Reduction (SCR) systems in order to reduce NO_x emissions.

Background

The MSPP is a 225 megawatt (MW) cogeneration power plant located near the City of Fellows in Western Kern County in the San Joaquin Valley inside the North Midway Sunset oil field. MSPP includes three turbine trains, each consisting of a GE Frame 7E gas turbine, dry-low NO_x combustors (DLN), and an unfired heat recovery steam generator. MSPP has been base loaded (operating at the maximum available level for the maximum available time) providing steam and power to the Midway Sunset oil field thermally enhanced oil recovery activities since May of 1989.

MSPP was originally licensed with water-injected Quiet Combustors. These were later retrofitted (via petition to amend) with DLN-15 combustors and then finally retrofitted with DLN-9 combustors. MSCC included in these petitions the surrender of the ability to burn Number 2 fuel oil. These petitions resulted in the reduction of NO_x emissions from the MSPP and were proposed by MSCC to comply with the District's retrofit rule, Rule 4703.

Laws Ordinances Regulations and Standards

Other than demonstrating compliance with Rule 4703, no laws, ordinances, regulations or standards will be affected by the proposed modifications.

Rule 4703 is intended to control NO_x emissions from stationary gas-turbine systems that are equal to or greater than 0.3 MW and/or have a maximum heat input rate of 3,000,000 Btu per hour (with exceptions provided). Rule 4703 allows several options for compliance depending on size, application and timing of implementation. Based on their size and application (larger than 10 MW and a combined-cycle application), MSCC has chosen the "Standard" emission limit and corresponding timing of implementation for the MSPP. Thus, MSPP will be required to limit the project NO_x emissions from each exhaust stack to less than 5 ppm at 15 percent O₂ with a three-hour rolling average, with two trains to be completed by April 30, 2004 and the remaining train by April 30, 2005 or 30 days after the next major overhaul after April 30, 2004.

Analysis

Condition of Certification AQ-18 establishes the hourly emission limits for the MSPP. The original license established hourly emission limits assuming that MSPP would use water-injected Quiet Combustors, but was amended to allow for the installation of (first) DLN-15 Combustors and (subsequently) DLN-9 Combustors over a period of years during the normal major overhaul schedule for the project.

MSCC proposes to eliminate the emission limits pertaining to the Quiet Combustors and the DLN-15 Combustors as they have all been successfully replaced with the DLN-9 Combustors. Furthermore, MSCC proposes to retain the emission limits for the DLN-9 Combustors and add emission limits for the staged installation of the SCR systems. This will allow MSCC to install the SCR systems during the normal major overhaul schedule. While both sets of emission limits will establish limits for all the criteria pollutants, the only difference between the two are the NO_x emission limits. MSCC proposes to lower the NO_x emission limit from 36.08 pounds-mass per hour (lbm/hr) to 18.04 lbm/hr (i.e., by half, from 10 parts per million (ppm) to 5 ppm).

MSCC proposes to install ammonia injected SCR systems to control NO_x emissions. SCR systems emit a small amount of unreacted ammonia into the stack emissions, referred to as ammonia slip. The California Air Resources Board staff guidelines recommend an ammonia slip limit of 5 ppm @ 15 percent O₂ averaged over 24 hours for this class of turbine. The Commission has recently licensed several power plants at the 5 ppm ammonia limit. MSCC has included with their petition a manufacturer's performance guarantee of 2.5 ppm NO_x @ 15 percent O₂ in conjunction with an ammonia slip of 5 ppm @ 15 percent O₂. However, from the District's Best Available Control Technology (BACT) determination procedures, the District is proposing an ammonia slip limit of 10 ppm @ 15 percent O₂ averaged over 24 hours. Additionally, the Commission licensed the Western Midway-Sunset Power Project on March 21, 2001 (a related project on an adjacent site) with a 10 ppm ammonia slip limit, which was considered state-of-the-art at the time.

Notwithstanding the Western Midway-Sunset license, staff recommends the 5 ppm ammonia slip limit based on the CARB recommendation and the manufacturer's guarantee. However, due to the fact that the amendment at the District level does not trigger a full public review, staff can not comment directly on the District proposed ammonia slip limit for Midway-Sunset. Thus, staff proposes to incorporate both the 5 ppm limit and the 10 ppm limit into Condition of Certification AQ-48.

Conditions of Certification AQ-49 through AQ-54 contain the additional requirements for monitoring, recording and reporting the ammonia slip emissions.

Conclusions and Recommendations

Staff has analyzed the proposed changes and concludes that there are no significant impacts associated with approval of the petition. Staff concludes that the proposed changes are based on information that was not available during the original licensing procedures. Staff concludes that the proposed language retains the intent of the original Commission Decision and Conditions of Certification. Staff recommends the following modifications to Condition of Certification AQ-18, and the addition of Conditions of Certification AQ-48 through –54.

Proposed Modifications to the Air Quality Conditions of Certification

The following conditions of Certification have been either added new or are modifications of the original. New language is in bold/underline and deleted language is in ~~strikethrough~~.

AQ-18

~~Pollutant emissions from each water injection combustion turbine shall not exceed the following limits (in pounds mass per hour, lbm/hr) except during times of start-up or shutdown (as described in Condition of Certification AQ-44):~~

~~Gas-Fired Case:~~

Particulate	9.98	lbm/hr
Sulfur Compounds	0.92	lbm/hr as SO₂
Oxides of Nitrogen	79.01	lbm/hr as NO₂
Hydrocarbons (nonmethane)	9.00	lbm/hr
Carbon Monoxide	94.00	lbm/hr

~~Pollutant emissions from each DLN-15 dry low NO_x combustion turbine shall not exceed the following limits (in pounds mass per hour, lbm/hr) except during times of start-up or shutdown (as described in Condition of Certification AQ-44):~~

~~Gas-Fired Case:~~

Particulate	9.98	lbm/hr
Sulfur Compounds	0.92	lbm/hr as SO₂
Oxides of Nitrogen	59.90	lbm/hr as NO₂
Hydrocarbons (nonmethane)	9.00	lbm/hr
Carbon Monoxide	54.91	lbm/hr

Pollutant emissions from each DLN-9 dry low NO_x combustion turbine shall not exceed the following limits (in pounds mass per hour, lbm/hr) except during times of start-up or shutdown (as described in Condition of Certification AQ-44):

Gas-Fired Case:

Particulate	9.98	lbm/hr
Sulfur Compounds	0.92	lbm/hr as SO ₂
Oxides of Nitrogen	36.08	lbm/hr as NO ₂
Hydrocarbons (nonmethane)	9.00	lbm/hr
Carbon Monoxide	54.91	lbm/hr

Pollutant emissions from each SCR controlled combustion turbine shall not exceed the following limits (in pounds mass per hour, lbm/hr) except during times of start-up or shutdown (as described in Condition of Certification AQ-44):

Gas-Fired Case:

<u>Particulate</u>	<u>9.98</u>	<u>lbm/hr</u>
<u>Sulfur Compounds</u>	<u>0.92</u>	<u>lbm/hr as SO₂</u>
<u>Oxides of Nitrogen</u>	<u>18.04</u>	<u>lbm/hr as NO₂</u>
<u>Hydrocarbons (nonmethane)</u>	<u>9.00</u>	<u>lbm/hr</u>
<u>Carbon Monoxide</u>	<u>54.91</u>	<u>lbm/hr</u>

Verification: ~~The combustion turbine identified as Unit B shall have completed the installation and testing of DLN-9 technology no later than January 31, 2001. The combustion turbine identified as Unit A shall have completed the installation and testing of DLN-9 technology no later than May 31, 2001. The combustion turbine identified as Unit C shall have completed the installation and testing of DLN-9 technology no later than June 30, 2001. The combustion turbines identified as Units A and B shall have completed the installation and testing of the SCR system no later than April 30, 2004. The combustion turbine identified as Unit C shall have completed the installation and testing of SCR system no later than April 30, 2005.~~

- a. At least 60 days before commercial operation date of the power cogeneration facility, or 60 days before the permit to operate anniversary date, the owners shall submit to the SJVUAPCD, CARB and the CEC a detailed performance test plan for the power plant's AECS. The performance test will be funded by the owners and conducted by a third party approved by the SJVUAPCD and CARB. The SJVUAPCD will notify the owners and the CEC of its approval, disapproval, or proposed modifications to the plan within 30 days of receipt of the plan. The owners shall incorporate the SJVUAPCD and the Commission's comments or modifications to the plan.
- b. The owners shall notify the SJVUAPCD and the CEC, within five days, before the facility begins commercial operation. The owners shall also notify the SJVUAPCD one week prior to the beginning of

- testing to allow the SJVUAPCD to observe and/or conduct concurrent sampling.
- c. Compliance with emission limits shall be demonstrated by a SJVUAPCD witnessed sample collection performed by an independent testing laboratory within 60 days after startup of this equipment and annually within 60 days prior to permit anniversary date.
 - d. The owners shall submit the results of the compliance test within 30 days of completion of the tests. The owners shall submit to the SJVUAPCD, its application for a Permit to Operate via registered mail. The owners shall submit a copy of the application to the CEC within 10 days of its submittal to the SJVUAPCD. The SJVUAPCD shall approve or disapprove the application as prescribed in the SJVUAPCD rules.

AQ-48 The emission of unreacted ammonia slip from any exhaust stack shall not exceed 5 ppm @ 15 percent O₂ averaged over 24 hours.

Verification: The owner shall monitor and record the ammonia slip from each exhaust stack as required in Conditions of Certification AQ-49 through AQ-54. The owner shall report the ammonia slip as part of the quarterly emission report required by Condition of Certification AQ-21.

AQ-49 Each CTG shall be equipped with a continuously recording emission monitor preceding the SCR module measuring NO_x concentration for the purpose of calculating ammonia slip. The owner shall check, record and quantify the calibration drift (CD) at two concentration values at least once daily (approximately 24 hours). The calibration shall be adjusted when ever the daily zero or high-level CD exceeds 5 percent. If either the zero or high-level CD exceeds 5 percent for five consecutive daily periods, the analyzer shall be deemed out-of-control. If either the zero or high-level CD exceeds 10 percent during any CD check, the analyzer shall be deemed out-of-control. If the analyzer is out-of-control, the owner shall take appropriate corrective action and then repeat the CD check.

Verification: The owner shall report the CD checks for each day as part of the quarterly emission report required by Condition of Certification AQ-21.

AQ-50 Each ammonia injection grid shall be equipped with an operational ammonia flow-meter and injection pressure indicator.

Verification: The owner shall make the site available for inspection by the SJVUAPCD, CARB and the CEC during construction and operation with reasonable notice.

AQ-51 Each heat recovery steam generator design shall provide for additional selective catalytic reduction and oxidation catalyst if required to meet NOx and CO emission limits.

Verification: The owner shall make the site available for inspection by the SJVUAPCD, CARB and the CEC during construction and operation with reasonable notice.

AQ-52 The owner shall monitor and record the exhaust gas temperature at the selective catalytic reduction and oxidation catalyst inlets.

Verification: The owner shall report the inlet temperature as recorded as part of the quarterly emission report required by Condition of Certification AQ-21.

AQ-53 Ammonia shall be injected whenever the selective catalytic reduction system catalyst exceeds the minimum ammonia injection temperature recommended by the manufacturer.

Verification: The owner shall report the ammonia injection rate as part of the quarterly emission report required by Condition of Certification AQ-21.

AQ-54 Compliance with the ammonia slip limits (Condition of Certification AQ-48) shall be demonstrated by using the following calculation procedure:

$$A_s = ((a - (b \times c / 1,000,000)) \times 1,000,000 / b) \times d$$

where: A_s = ammonia slip (ppmv @ 15 percent O₂)

a = ammonia injection rate (lbs/hr)/17(lbs/lb. mol)

b = dry exhaust gas flow rate (lbs/hr)/(29(lbs/lb. mol)

c = change in measured NOx concentration across the catalyst (ppmv @ 15 percent O₂), and

d = correction factor. The correction factor shall be derived annually during compliance testing by comparing the measured and calculated ammonia slip.

Verification: The owner shall report ammonia slip required in Condition of Certification AQ-48 via the indicated calculation procedure. The owner shall submit for approval the ammonia source testing protocols no later than 30 days prior to the annual ammonia slip source-testing date. The owner shall notify the CEC and the SJVUAPCD no later than 10 days prior to the date of the annual ammonia source test. The owner shall submit for approval the results of the annual ammonia source test including any changes to the correction factor "d" above within 90 days of the completion of the annual ammonia source test.

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